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10/502002

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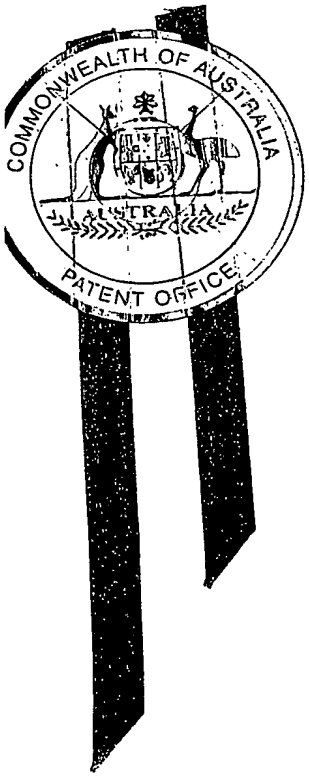

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AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Invention Title: **Cutting and folding machine**

The invention is described in the following statement:

CUTTING AND FOLDING MACHINE

Field of the Invention

This invention relates to machines for cutting foil from a sheet into rectangular pieces with one edge folded over to provide reinforcement along that edge.

Background of the Invention

Rectangular pieces of foil of the above type are used in large numbers in the process of hair colouring in hair salons and the like.

In this process, an individual lock of hair is laid on the foil, and the colouring compound (usually a gel, paste, or viscous liquid) is brushed onto the hair. After applying the colouring compound, the outer end of the foil rectangle is folded up, then sides are folded in, and; so as to make a small pocket or pouch containing the lock of hair and the colouring compound. This process is repeated until all the hair to be coloured is contained in these pockets.

Fifty or so foil rectangles may be used for each head of hair that is coloured, In most cases these foil rectangles are made by hand; a wasteful and costly exercise. Packets of precut foil rectangles are available, but these are seldom used. The foil rectangles are prepared in advance, and are placed in batches in a receptacle at the colourists work station. Because the frailty of the foil, the rectangles at the colourists work station can become creased and dog eared, requiring further work before each is used.

It is the object of the invention to provide a machine capable of manufacturing large numbers of foil rectangles at a centralised location, to be distributed to individual work stations as is the present practice. Another objective of at least the preferred embodiment is to produce foil rectangles one at a time on demand at each colourist's work station, so that each rectangle is available in

prime condition, not requiring any remedial action by the colourist.

Summary of the Invention

In one aspect, the invention provides a machine for cutting and edge folding rectangular foils, including means for feeding a length of foil to a cutting/folding station, means for causing the feeding means to dwell for a predetermined time when the foil reaches said cutting/folding station, means for supporting a predetermined portion of said length of foil, means for cutting the supported foil, means for folding the cut edge about a fold forming means, and means for discharging the edge folded length of foil from the machine.

Although the machine is presently intended to produce rectangles from aluminium foil, which may have one or both sides coated with organic film or paint, the machine could also make the rectangles from foils of other metals, paper, treated paper, paper laminated with plastic film or metallic foil, plastic film, or plastic film laminated with metallic foil.

In a preferred form, the cutting means is configured to fold the cut edge under the fold forming means. The fold forming means may comprise an edge of a plate for supporting the foil as it is fed through the machine.

The machine preferably holds the supported portion of foil under tension. This can be achieved in several ways, as described further below.

The machine preferably also includes means for forming one or more elongate embossments along the length of foil to further reinforce the edge folded foil.

The cutting means preferably includes a serrated blade to reduce the cutting force required to sever the foil portion from the length of foil. The blade is preferably configured to fold the cut edge of the foil under the fold forming means as the foil is cut. To this end, the blade is preferably mounted on a rotatable shaft which is biased to return to a rest position clear of the length of foil once the fold has been formed in the cut edge of the foil.

To obtain a higher degree of folding than that achieved by the blade alone, a projection may be provided which extends from the blade on the infeed side of the blade. Preferably, the projection is spaced from the cutting edge of the blade. In a preferred form, the projection is elongate, extending continuously for the full length of the blade. The projection may be in the form of a lobe. In a most preferred form of the invention, the lobe is incorporated into an elongate lobe member having a flat portion lying against the infeed side of the blade with the lobe projecting from the infeed side of the blade. The lobe member may be mounted together with the blade on the rotatable shaft.

The feeding means preferably comprises spaced pairs of rollers between which the foil is fed. One of the each pair of rollers is preferably provided with a compressible covering and at least one of each pair of rollers is driven by a suitable drive means. In a particularly preferred form, the other of each pair of rollers is preferably formed with one or more grooves to form the elongate embossment in the foil as it is fed through the machine.

The drive means is an intermittent drive means having a dwell period of a predetermined time to enable the cutting and folding of the foil to be performed while the foil is stationery. Alternatively, the cutting and folding means may be arranged to travel with the foil as it is fed through the machine.

In its simplest form, the drive means is driven by a manual crank, and the dwell period is achieved by a suitably configured cam in the drive mechanism connected to the crank. Alternatively, an electric motor may be used to be provide drive to the drive means.

The foil is preferably taken from a roll which is suitably cradled, such as by suitably spaced rollers, to allow feeding of the foil from the roll. The cradling means may be provided with a self-alignment means to prevent creasing of the foil as it is fed through the machine.

Brief Description of the Drawings

In order that the invention may be more readily understood, one preferred

embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is schematic side elevation of the machine showing its components;

Figure 2 is a side elevation of the far side of the machine showing the drive mechanism;

Figure 3 is a side elevation of the near side of the machine showing the motor or crank mechanism of the drive means;

Figure 4 is a side elevation illustrating the drive for the feeding rollers; and

Figures 5 and 6 are sectional end elevations along the lines a-a and b-b, further detailing the drive mechanism and feeding means;

Figure 7 is a detailed schematic side view of the cutter in a first position;

Figure 8 is detailed schematic side view of the cutter of Figure 7 shown in a second position cutting the foil;

Figure 9 is detailed schematic side view of the cutter of Figure 7 at the extreme end of the cutting stroke.

Description of Preferred Embodiment

Referring firstly to Figure 1 of the drawings, the cutting and folding machine embodying the invention provides for a roll of foil to be cradled between two rolls 1, from where the foil may be uncoiled into the machine.

The foil passes between two rolls (2) and (2a), which are driven intermittently, and which feed the foil into the machine.

The foil next passes over a plate (3) which supports the foil. This plate also provides a forming edge (3a), around which the foil is folded during the cutting operation. It should be understood that the single plate (3) shown in Figure 1 is

sufficient for operation of the machine in the horizontal orientation shown, and that for operation in other orientations (vertical, upside down, etc.) it may be necessary to provide additional plates to guide the foil through the machine.

After passing over the plate (3), the foil passes under an oscillating cutter blade (4) mounted on a shaft. After passing the oscillating cutter blade (4) the foil then passes between two outfeed rolls (5) and (5a), which are driven intermittently in synchronisation with the infeed rolls (2) and (2a) (the synchronisation of the intermittent motion of infeed and outfeed rolls need not be exact, but sufficient only to allow the cutting and folding operation to take place).

It has been found sufficient to drive one roll only, with the other roll idle and forced against the driven roll. It has also been found advantageous to have one roll with an elastomeric or rubbery surface, in order to accommodate irregularities. In addition, it has also been found advantageous to have an engraved surface on the roll that engages the rubbery roll, in order to emboss the foil longitudinally, and so stiffen it. In the case of the outfeed rolls (5) and (5a), the embossing may take the form of written or diagram instructions, or advertising. It has also been found advantageous to drive the outfeed rolls at a slightly higher speed than the infeed rolls and to drive these in a manner that torque is limited (such as a simple belt drive); in this manner any slack is taken up in the foil strip between the infeed and outfeed rolls, but the torque is insufficient to damage the strip.

During the dwell period in the drive of the infeed and outfeed rolls, the strip of foil is held tight between the infeed and outfeed rolls by action of the belt drive connecting the two sets of rolls (it could also be held tight by other means, such as locking the rolls). During the dwell period, and while the foils is so held, the oscillating cutter blade (4) (which is a blade (4a) protruding tangentially from a shaft parallel to the infeed and outfeed rolls) is then rotated so as to pierce and cut the strip of foil, and continues to rotate so as to fold the end of foil on the infeed roll side over the edge of the edge (3a) of the plate (3). After reaching an extreme position at which the foil is folded under the plate, the cutter blade (4) returns to a position that is removed from the path of foil through the machine, before the intermittent drive to the foil is resumed. It has been found advantageous that the

cutter blade should have a serrated cutting edge, in order to reduce cutting forces.

After the cutting and folding operation of the oscillating blade (4), the intermittent drive of the feed rolls is resumed. The outfeed rolls discharge the cut piece of foil, and the infeed rolls move the strip of foil forward so that the folded end moves forward from the edge of the plate (3a). The folded end of the strip continues to move forward to be caught between the outfeed rolls. The outfeed rolls compress the folded end to a tightly folded configuration, and drive the strip forward at a higher speed than the infeed rolls, removing any slack from the strip. The cycle repeats when the dwell period in the feed is reached, and another individual piece of cut and folded foil is produced.

Referring to Figures 3 and 6, a convenient arrangement of the machine is shown in which the rolls (2), (2a), (5) and (5a) are held in two U shaped frames. A drive shaft (6) passes through one frame. This allows the shaft to be driven at one side of the machine by hand crank or motor (7). At the other end are components that provide the intermittent drive to the feed rolls, and actuate the oscillating cutter.

The outermost drive components provide a belt drive (Figures 4 and 5) between the infeed and outfeed rolls. It has been found sufficient to use an elastomer O-ring (8) running in sheaves (9) attached to the feed rolls for this purpose. The difference in speed of the infeed and outfeed rolls is achieved by adjusting the diameters of the sheaves.

As shown in Figures 2 and 3, the drive components located inboard of the belt drive 8 provide the intermittent motion to the rolls. It has been found sufficient to use a wheel (10) driving an O-ring (11) on the sheave (9) attached to the infeed roll for this purpose. By cutting away a section (12) of the drive wheel (10), the drive to the feed rolls is disengaged during a part of the rotation of the drive wheel, and an intermittent drive to the feed rolls is provided.

The drive components located in the extreme inboard position provide the oscillating motion to the cutter blade. It has been found sufficient to oscillate the

blade by means of a cam (13) which operates on a follower (14) attached to the cutter shaft during the dwell period of the feed roll drive. Alternatively, cam (13) may be replaced by a roller on wheel (10) and follower (14) may be in the form of an arm attached to the cutter shaft.

Other drive means might be employed to achieve the same motions and instead of a hand crank (not shown) the drive means may be driven by an electric motor.

Figure 7 to 9 show a modified form of the cutter (4). The cutter (4) includes the rotatable shaft (4b) and a cutting blade (4a) as per the previous embodiment. In particular, the rotatable shaft (4b) is an elongate hexagonal rod and thus the cutting blade (4a) can be fixed against one of the flat sides of the hexagonal rod. Alternatively, the rotatable shaft may comprise a cylindrical roller with a flat machined thereon to mount the blade tangentially. The cutting blade (4a) is clamped by an elongate crescent shaped extrusion (4e) and fastened by fastener (4f). The hexagonal rod (4b) has a travel of approximately 90 degrees from the position illustrated in Figure 7 to the extreme position illustrated in Figure 9.

The embodiment of Figures 7 to 9 includes a elongate lobe member (4c) which lies between the cutting blade (4a) and the hexagonal rod (4b). The lobe member (4c) comprises a flat portion which lies flat against the cutting blade (4a) and a lobe portion (4d) which projects from the blade. The lobe portion (4d) projects towards the infeed side of the foil and is spaced from the cutting edge of the blade (4a).

Figure 8 illustrates the cutting of the foil at the cutting edge of the blade (4a). As the cutter (4) continues in its path of rotation from the position shown in Figure 8 to that of Figure 9, the foil will come in contact with the infeed side of the blade (4a) and be folded downwardly towards the underside of the plate (3). At some point, the lobe portion (4d) will contact the foil enabling a more acute fold to be achieved than if the lobe portion (4d) were not present. The cutter (4) then returns to the position illustrated in Figure 7 and the process continues as

described in connection with the first embodiment.

The lobe portion (4d) is configured such that it does not touch the underside of the plate 3 in the extreme position of the cutter (4) illustrated in Figure 9. It is preferred that there is separation of at least .25mm. Otherwise, the lobe portion (4d) could unintentionally cut the foil. In another preferred embodiment, there may be two projecting lobe portions such that in the extreme position of Figure 9, one lobe portion is disposed on the underside of plate (3) and another is disposed in the region slightly above the plate (3) to form a crisp edge on the foil.

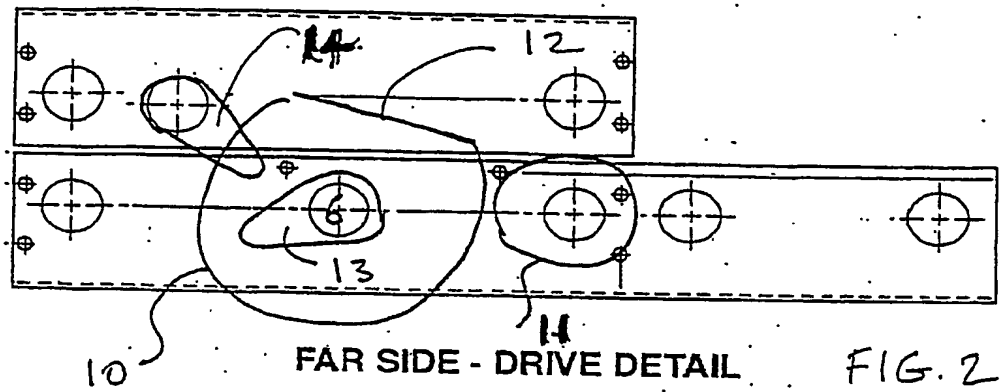
The coil cradle can be modified to improve tracking of the foil strip, and to stop the coil running on through its own inertia during dwell periods in the feeding of the strip. In this modification, the two rolls (1) are replaced by an upturned channel section, covered with felt. The channel section is attached loosely at a pivot point located between a portion from just ahead of and just behind centre, so that it allows the coil to align with the direction of uncoiling.

The coil of foil rests on felt covered surfaces, and these are sufficiently soft to prevent damage to the surface of the foil. The upturned channel section provides two lines of support, with enough friction to avoid over run, but damped rolls on a pivoted carriage might just as well be used.

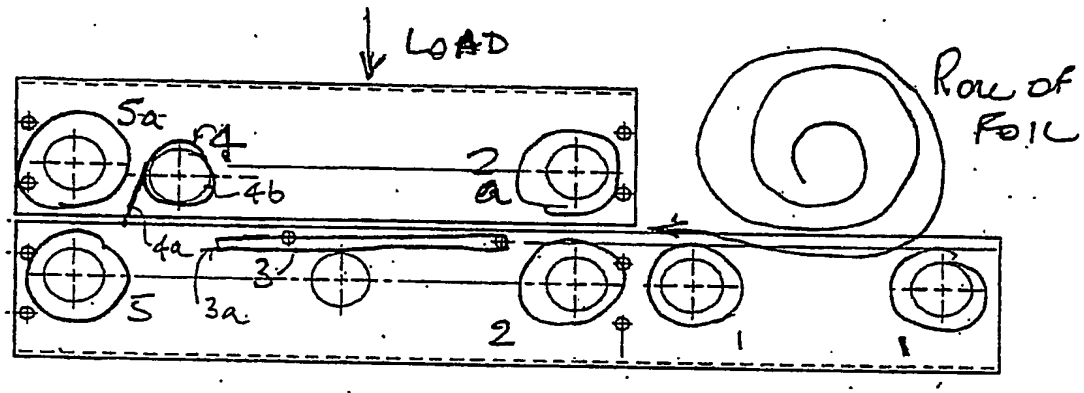
Since modifications within the spirit and scope of the invention may be readily effected by persons skilled in the art, it is to be understood that the invention is not limited to the particular embodiment described, by way of example, hereinabove.

JAMES DOUGLAS FARFOR

By Freehills Carter Smith Beadle
Registered Patent Attorneys for the Applicant DATED: 26 July 2002

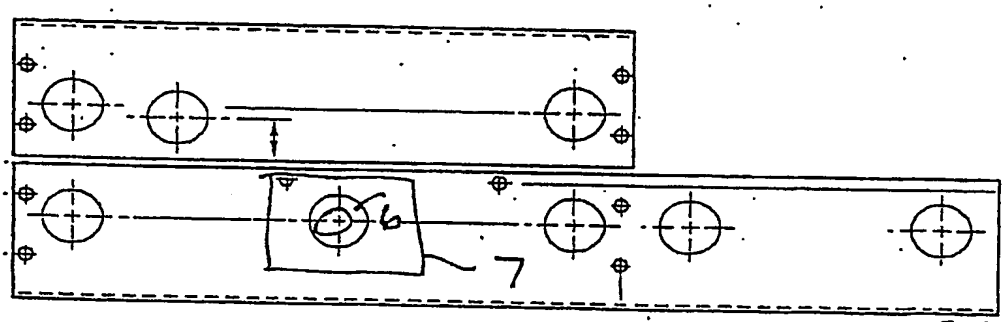


FAR SIDE - DRIVE DETAIL FIG. 2



CENTRE - MACHINE COMPONENTS

FIG. 1



NEAR SIDE - MOTOR OR CRANK FIG. 3

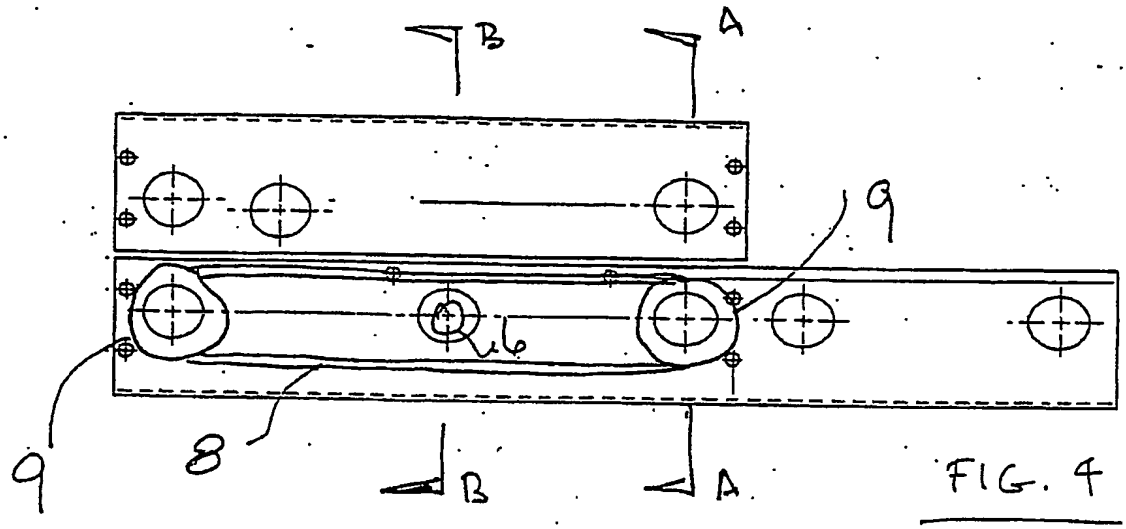
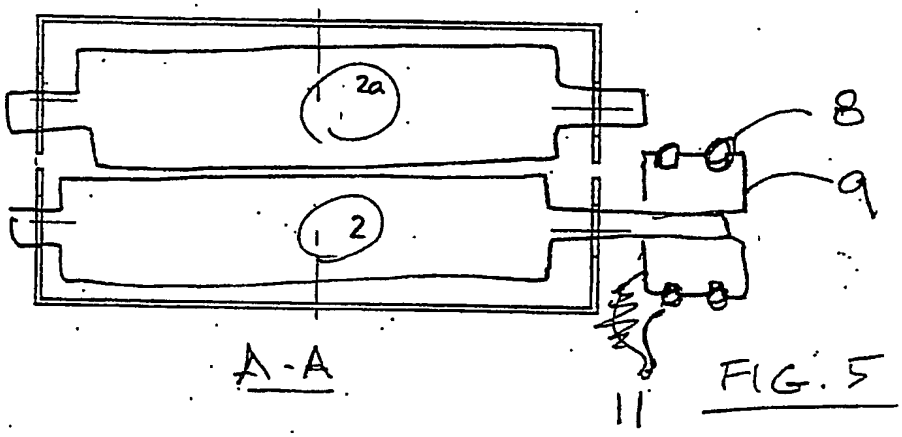
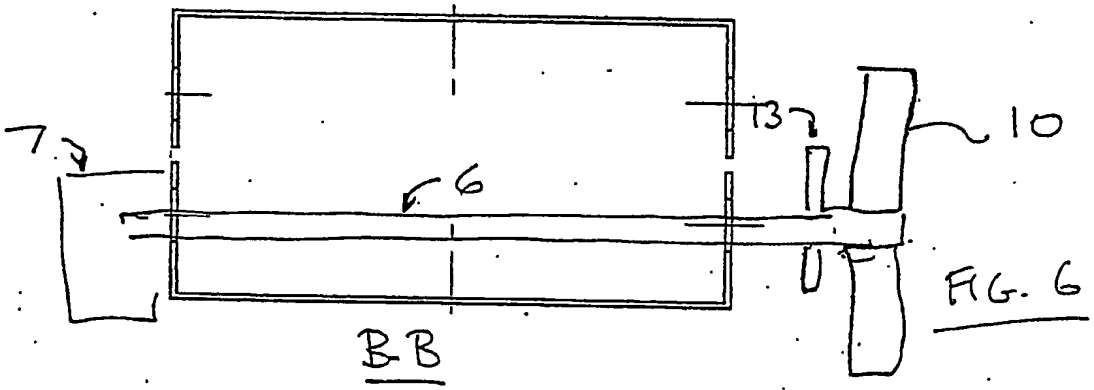


FIG. 4



A-A

FIG. 5



BB

FIG. 6

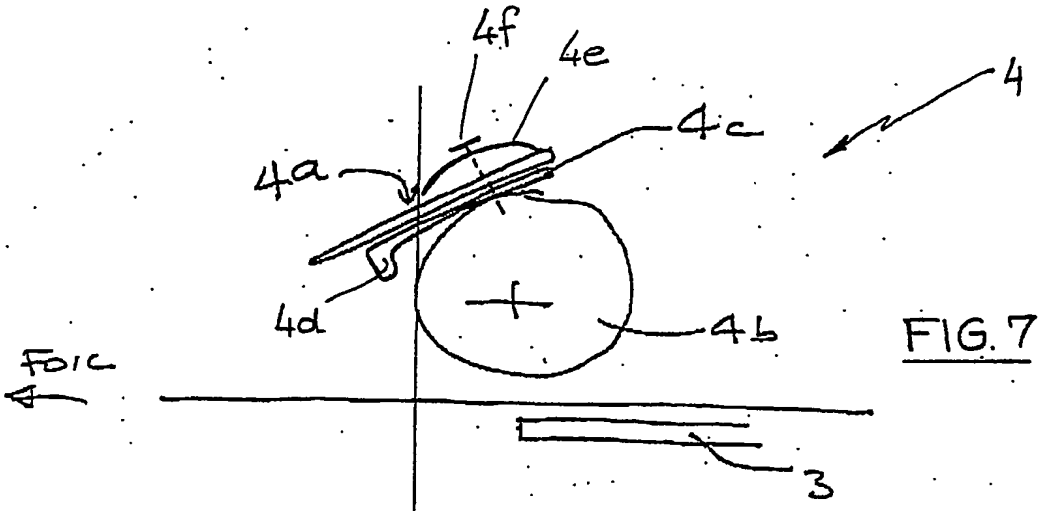


FIG. 7

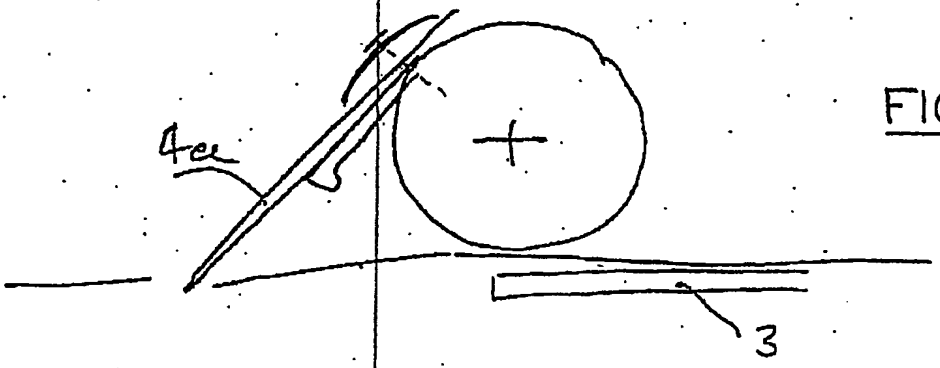


FIG. 8

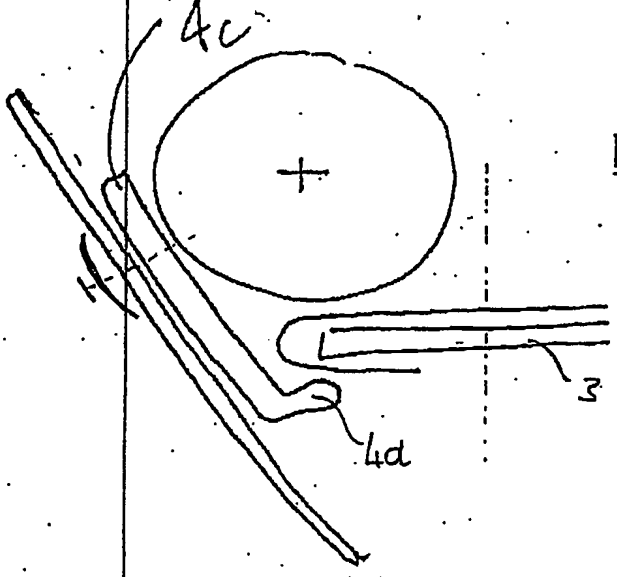


FIG. 9

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